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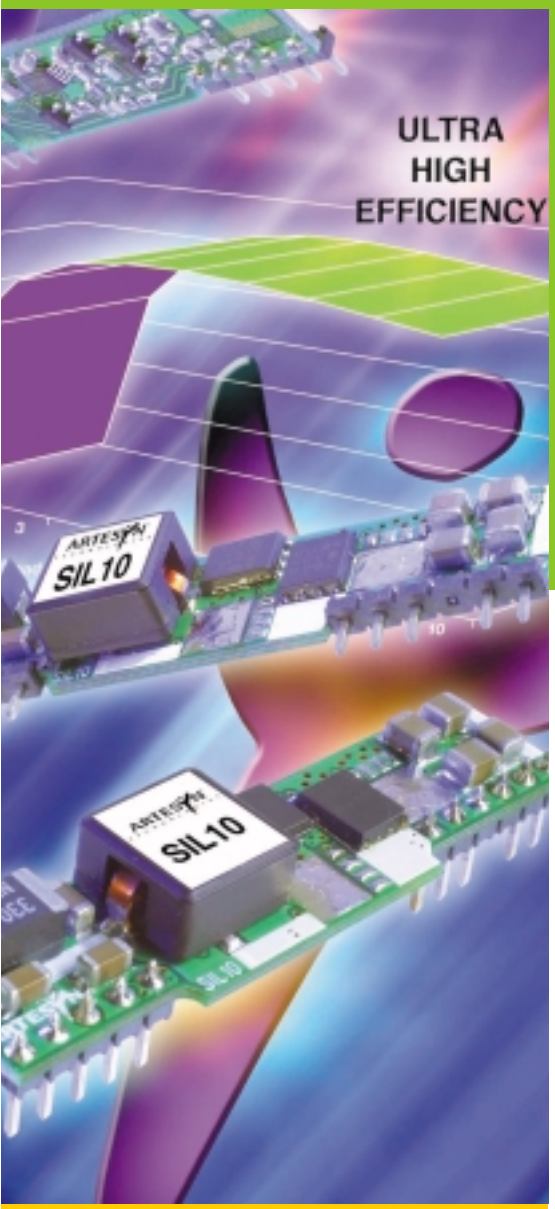
SIL10 SERIES

Jameco Part Number 219133

Single output



- Current rating of 10A
- Outputs of between 0.8V and 3.3V, fixed and flexible
- Applications for 5V or 3.3V input POL converters
- High power density 107W/in^3
- High efficiency - typically 96% for 5V and 3.3V out
- POL converter that saves board space - vertical or horizontal versions
- Industry standard footprint
- Remote sense and remote ON/OFF

THE SIL10 series are non-isolated DC/DC converters packaged in a single-in-line footprint giving designers a cost effective solution for conversion from either a 5V or 3.3V input to output voltages of 3.3V to 0.8V. The SIL10 offers both fixed outputs and wide a output trim range, which allows maximum design flexibility and a pathway for future upgrades. Local voltage conversion by the SIL10 series from existing 5V or 3.3V system voltages eliminates the need for redesign of existing power architectures when voltage requirements change. The SIL10 is designed for applications that include distributed power, workstations, optical network and wireless applications. Implemented using state of the art surface mount technology and automated manufacturing techniques, the SIL10 offers compact size and efficiencies of up to 96%.

[2 YEAR WARRANTY]

c UL us TÜV

ARTESYN® TECHNOLOGIES

Stresses in excess of the maximum ratings can cause permanent damage to the device. Operation of the device is not implied at these or any other conditions in excess of those given in the specification. Exposure to absolute maximum ratings can adversely affect device reliability.

Absolute Maximum Ratings

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - continuous	$V_{in\ (cont)}$	-0.3		5.5	V DC	$V_{in}(+) - V_{in}(-)$
Input voltage - peak/surge	V_{surge}	-0.3		6	V DC	2s max, non-repetitive
Operating temperature	T_{op}	-40		100	ºC	Measured at thermal reference points, see Note 1 for thermal de-rating
Storage temperature	$T_{storage}$	-40		125	ºC	
Output power (3V3W)	Pout (max)	0		33	W	
Output power (3V3S)	$P_{out\ (max)}$	0		33	W	
Output power (2V5S)	$P_{out\ (max)}$	0		25	W	

All specifications are typical at nominal input Vin = 5V, full load under any resistive load combination at 25˚C unless otherwise stated.

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - operating	$V_{in\ (oper)}$	3	5	5.5	V DC	Note 2
Input current - no load	I_{in}		70	100	mA DC	V_{in} (min) - V_{in} (max), enabled
Input current - Quiescent	$I_{in\ (off)}$		5		mA DC	Converter disabled
Inrush current (i^2t)	linrush		1		A^2s	Complies with ETS300 132 Part 4.7, with recommended LISN
Input ripple			200		mA	Frequency <1 kHz
Input fuse*				12.5	A	Slowblow/antisurge HRC recommended

*Fuse A - S(T) 1.25 x 0.25 inches
SIBA P/N 70-065-65/12.5ARS

Turn On/Off

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input voltage - turn on	$V_{in\ (on)}$	2.25	2.70	3	V DC	Will regulate @ V_{in} >3V if $V_{out} \leq$ 2V5
Turn on delay - enabled, then power applied	T_{delay} (power)		15		msec	With the enable signal asserted, this is the time from when the input voltage reaches the minimum specified operating voltage until the output voltage is within the total regulation band
Turn on delay - power applied, then enabled	T_{delay} (enable)		15		msec	$V_{in} = V_{in}$ (nom), then enabled. This is the time taken until the output voltage is within the total error band
Rise time	T_{rise}		15		msec	From 10% to 90%; full resistive load, no external capacitance

Signal Electrical Interface

Characteristic - Signal Name	Symbol	Min	Typ	Max	Units	Notes and Conditions
At remote/control ON/OFF pin Open collector or equivalent compatible						**See Notes 2 and 3** See Application Note 134 for Remote ON/OFF details
Control pin open circuit voltage	V_{ih}		0		V	I_{ih} = 0 µA; open circuit voltage
High level input current	I_{ih}	-0.2			µA	Current flowing into control pin when pin is pulled high
High level input voltage	V_{ih}	1.2			Vin	Converter guaranteed OFF when control pin is greater than V_{ih} (min)
Acceptable high level leakage current	I_{ih} (leakage)			10	µA	Acceptable leakage current from signal pin into the open collector driver (neg = from converter)
Low level input voltage	V_{il}	0		0.5	V	Converter guaranteed ON when control pin is less than V_{il} (max)
Low level input current	I_{il}		0.50		mA	V_{il} = < 0.4 V

Reliability and Service Life

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Mean time between failure	MTBF	680,000			Hours	MIL-HDBK-217F, V_{in} = $V_{in\ (nom)}$; I_{out} = $I_{out\ (max)}$; ambient 25ºC; ground benign environment
Mean time between failure	MTBF	7,042,000			Hours	Telecordia 332
Mean time between failure	MTBF	TBA			Hours	Demonstrated. This entry will be periodically updated as the number of test hours increase

Other Specifications

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Switching frequency	F_{SW}		300		kHz	Fixed frequency
Weight			5		g	

Referenced ETSI standards:

ETS 300 019: Environmental conditions and environmental tests for telecommunications equipment
ETS 300 019: Part 1-3 (1997) Classification of environmental conditions stationary use at weather protected locations
ETS 300 019: Part 2-3 (1997) Specification of environmental tests stationary use at weather protected locations

EMC
Electromagnetic Compatibility

Phenomenon	Port	Standard	Test level	Criteria	Notes and conditions
Immunity:					
ESD	Enclosure	EN61000-4-2	6kV contact 8kV air	NP	As per ETS 300 386-1 table 5

Performance criteria:

NP: Normal Performance: EUT shall withstand applied test and operate within relevant limits as specified without damage.
RP: Reduced Performance: EUT shall withstand applied test. Reduced performance is permitted within specified limits, resumption to normal performance shall occur at the cessation of the test.
LFS: Loss of Function (self recovery): EUT shall withstand applied test without damage, temporary loss of function permitted during test. Unit will self recover to normal performance after test.

Referenced ETSI standards:

ETS 300 386-1 table 5 (1997): Public telecommunication network equipment, EMC requirements
ETS 300 132-2 (1996): Power supply interface at the input to telecommunication equipment: Part 2 operated by direct current (DC)
ETR 283 (1997): Transient voltages at interface A on telecommunication direct current (DC) power distributions

Safety Agency Approvals

Characteristic	
UL	E174104
TÜV	TBA

Material Ratings

Characteristic - Signal Name	*Notes and Conditions*
Flammability rating	UL94V-0

Model Numbers

Model Number	*Input Voltage*	*Output Voltage*	*Output Current (Max.)*	*Typical Efficiency*	*Max. Load Regulation*
SIL10-05S2V5-V	3.0 - 5.5VDC	2.5V	10A	94%	1%
SIL10-05S2V5-H	3.0 - 5.5VDC	2.5V	10A	94%	1%
SIL10-05S3V3-V	4.5 - 5.5VDC	3.3V	10A	96%	1%
SIL10-05S3V3-H	4.5 - 5.5VDC	3.3V	10A	96%	1%
SIL10-05W3V3-V	4.5 - 5.5VDC	3.3V	10A	96%	1%
SIL10-05W3V3-H	4.5 - 5.5VDC	3.3V	10A	96%	1%

2V5S Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		5.3	6	A DC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	$I_{in\ (ripple)}$		200		mA rms mA pk-pk	$I_{out} = I_{out}$ (max.), measured with external filter. See Application Note 134 for details
Input capacitance - internal filter	C_{input}		18.8		µF	Internal to converter
Input capacitance - external bypass	C_{bypass}	100			µF	Recommended customer added capacitance

2V5S Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	Vo (nom)	2.43	2.5	2.57	V DC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom) Worst case condition over line, load, temperature and life
Total regulation band	V_o	2.38		2.612	V DC	For all line, static load and temperature until end of life
Line regulation				1	%	$I_{out} = I_{out}$ (nom); V_{in} (min) to V_{in} (max)
Load regulation				1	%	$V_{in} = V_{in}$ (nom); I_{out} (min) to I_{out} (max)
Output current continuous	I_{out}	0		10	A DC	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}			50 25	mV pk-pk mV rms	Measurement bandwidth: 20 MHz. See Application Note 134 for measurement set-up details

2V5S Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		50		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec
Load transient response - recovery	$T_{recovery}$		50		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}	0		10,000	µF	

2V5S Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Allowable output voltage trim range				10	%	Trim up (% of V_o nom). Note that the maximum output power is still 25W. Derate the maximum output current accordingly
		10			%	Trim down (% of V_o nom) See Application Note 134 for details of trim equations and trim curves
Open sense voltage				10	%	If Trim up is invoked de-rate accordingly

2V5S Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	93	94		%	I_{out} = 100% I_{out} (max), V_{in} = V_{in} (nom)
Efficiency	η	93	94		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

3V3S Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		7	8	ADC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	$I_{in\ (ripple)}$		200		mA rms mA pk-pk	$I_{out} = I_{out}$ (max.), measured with external filter.
Input capacitance - internal filter	C_{input}		18.8		µF	Internal to converter
Input capacitance - External bypass	C_{bypass}	100			µF	Recommended customer added capacitance

3V3S Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	V_o (nom.)	3.21	3.3	3.39	VDC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (nom) Worst case condition over line, load, temperature and life
Total regulation band	V_o	3.15		3.45	VDC	For all line, static load and temperature until end of life
Line regulation				1	%	$I_{out} = I_{out}$ (nom); $V_{in\ (min)}$ to V_{in} (max)
Load regulation				1	%	$V_{in} = V_{in}$ (nom); I_{out} (min) to I_{out} (max)
Output current continuous	I_{out}	0		10	ADC	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}			50 25	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 134 for set-up details

3V3S Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		50		mV	Peak deviation for 50% to 75% step load, di/dt = 100 mA/µsec
Load transient response - recovery	$T_{recovery}$		50		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}	0		10,000	µF	

3V3S Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Allowable output voltage trim range				10	%	Trim up (% of V_O nom). Note that the maximum output power is still 33W. Derate the maximum output current accordingly
		10			%	Trim down (% of V_O nom) See Application Note 134 for details of trim equations and trim curves
Open sense voltage				10	%	If Trim up is invoked de-rate accordingly

3V3S Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	94	95		%	I_{out} = 100% I_{out} (max), V_{in} = V_{in} (nom)
Efficiency	η	94	96		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

3V3W Model

Input Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Input current - operating	I_{in}		7	8	A DC	$V_{in} = V_{in}$ (nom); $I_{out} = I_{out}$ (max.); $V_o = V_o$ (nom)
Reflected ripple current	$I_{in\ (ripple)}$		200		mA rms mA pk-pk	$I_{out} = I_{out}$ (max.), measured with external filter.
Input capacitance - internal filter	C_{input}		18.8		µF	
Input capacitance - external bypass	C_{bypass}	100			µF	Recommended customer added capacitance

3V3W Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Nominal set-point voltage	V_o (nom)	3.21	3.3	3.39	V DC	$V_{in} = V_{in\ (nom)}$; $I_{out} = I_{out\ (nom)}$ Worst case condition over line, load, temperature and life
Total regulation band	V_o	3.15		3.45	V DC	For all line, static load and temperature until end of life.
Line regulation				1	%	$I_{out} = I_{out\ (nom)}$; $V_{in\ (min)}$ to $V_{in\ (max)}$
Load regulation				1	%	$V_{in} = V_{in\ (nom)}$; $I_{out\ (min)}$ to $I_{out\ (max)}$
Output current continuous	I_{out}	0		10	A DC	
Output current - short circuit	I_{sc}		10	20	A rms	Continuous, unit auto recovers from short, V_o < 100mV
Output voltage - noise	V_{p-p} V_{rms}			50 25	mV pk-pk mV rms	Measurement bandwidth 20 MHz See Application Note 134 for measurement set-up details

3V3W Model

Electrical Characteristics - O/P

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Load transient response - peak deviation	$V_{dynamic}$		50		mV	Peak deviation for 50% to 75% step load, di/dt = 100mA/µsec
Load transient response - recovery	$T_{recovery}$		50		µsec	Settling time to within 1% of output set point voltage for 50% to 75% step load
External load capacitance	C_{ext}	100		10,000	µF	

3V3W Model

Protection and Control Features

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Output voltage trim range				10	%	Trim up (% of V_O nom). Note that the maximum output power is still 33W. Derate the maximum output current accordingly
		75			%	Trim down (% of V_O nom) See Application Note 134 for details of trim equations and trim curves
Open sense voltage				10	%	If trim up is invoked de-rate accordingly

3V3W Model

Efficiency

Characteristic	Symbol	Min	Typ	Max	Units	Notes and Conditions
Efficiency	η	94	95		%	I_{out} = 100% Iout (max), V_{in} = V_{in} (nom)
Efficiency	η	94	96		%	I_{out} = 50% I_{out} (max), V_{in} = V_{in} (nom)

2V5S Model

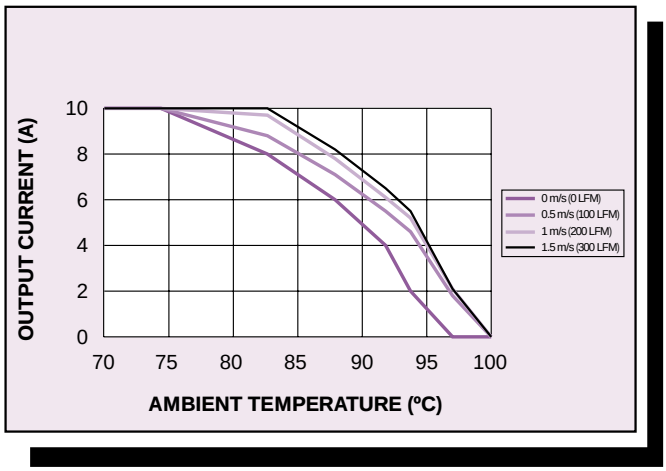


Figure 1: De-rating Curve with V_{in} = 3.3V and No Trim

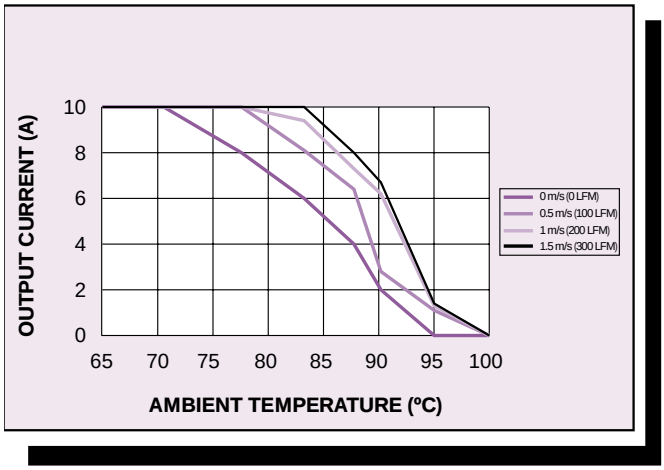


Figure 2: De-rating Curve with V_{in} = 5V and No Trim

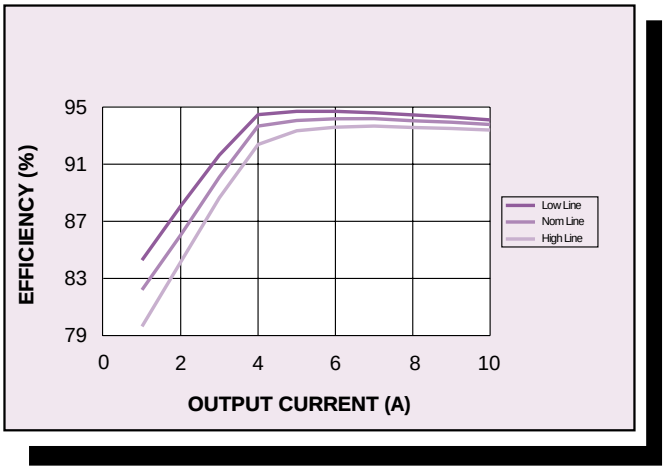


Figure 3: Efficiency vs Load

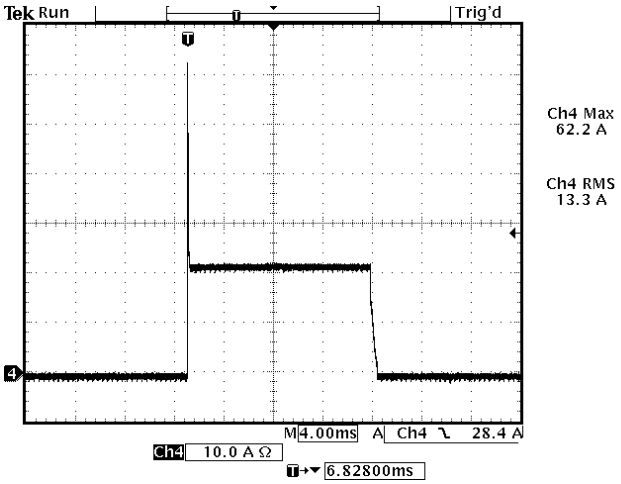


Figure 4: Short Circuit Characteristic

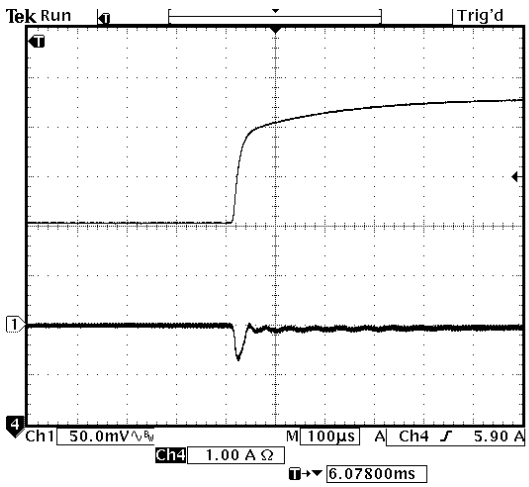


Figure 5: Typical Transient Response 50% - 75% Step Load Change

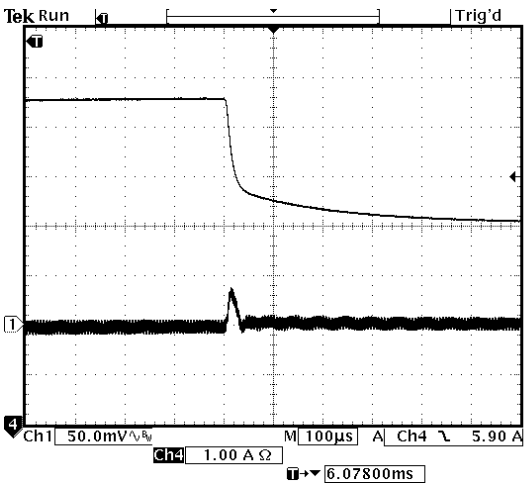


Figure 6: Typical Transient Response 75% - 50% Step Load Change

2V5S Model

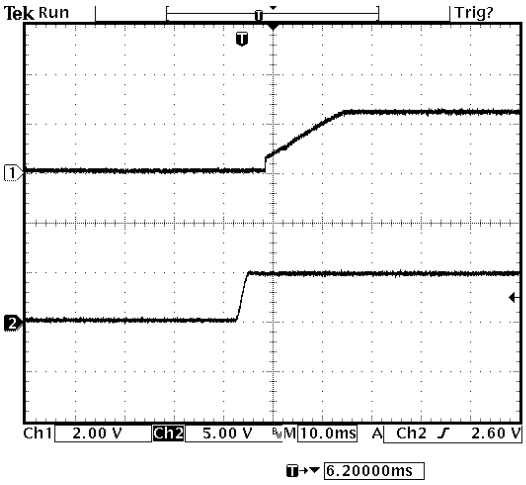


Figure 7: Typical Power-up Characteristic

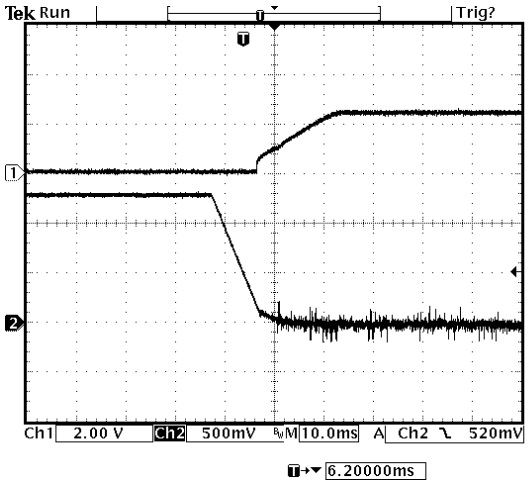


Figure 8: Control On/Off Characteristic

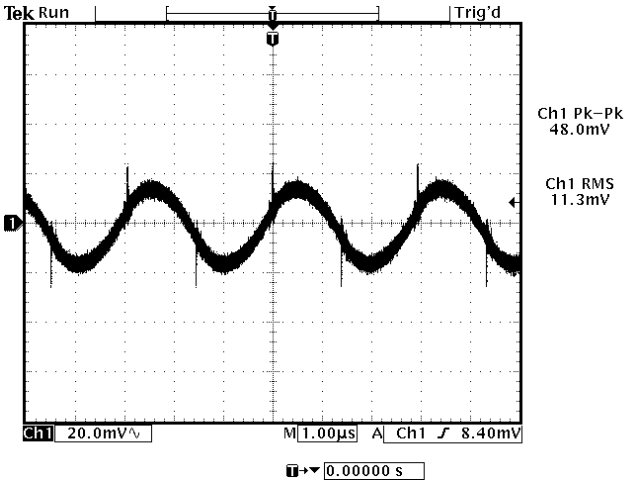


Figure 9: Typical Ripple and Noise

3V3S Model

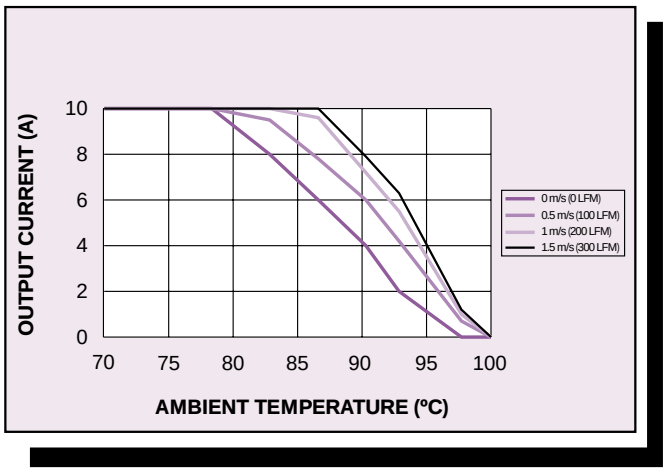


Figure 10: De-rating Curve with V_{in} = 5V and No Trim

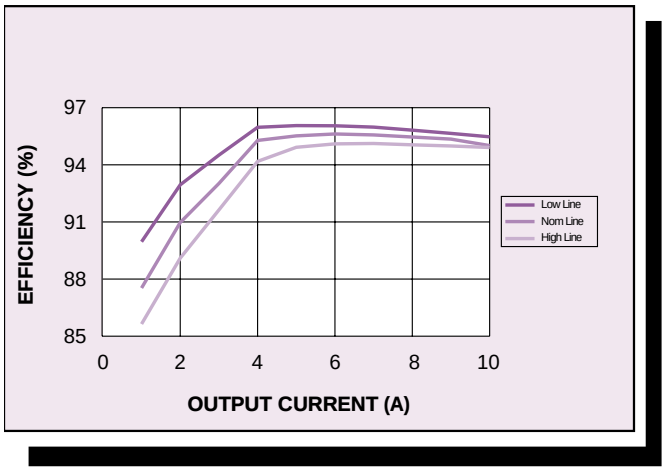


Figure 11: Efficiency vs Load

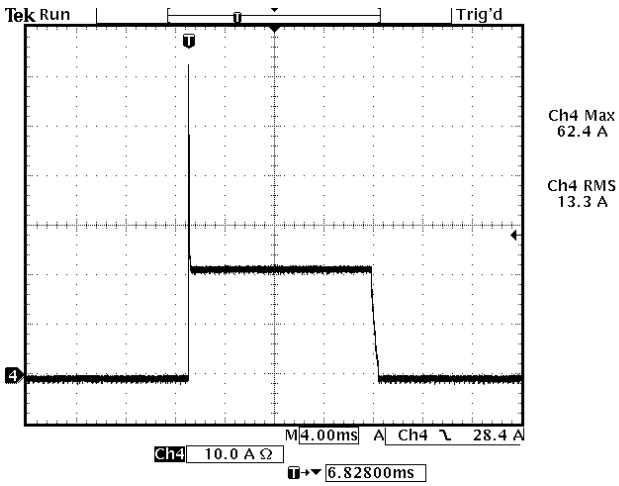


Figure 12: Short Circuit Characteristic

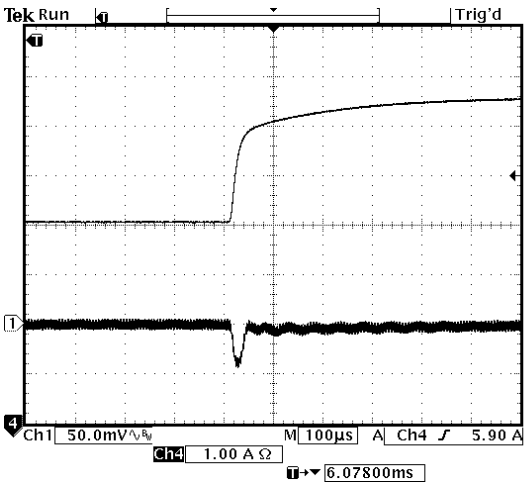


Figure 13 Typical Transient Response 50% - 75% Step Load Change

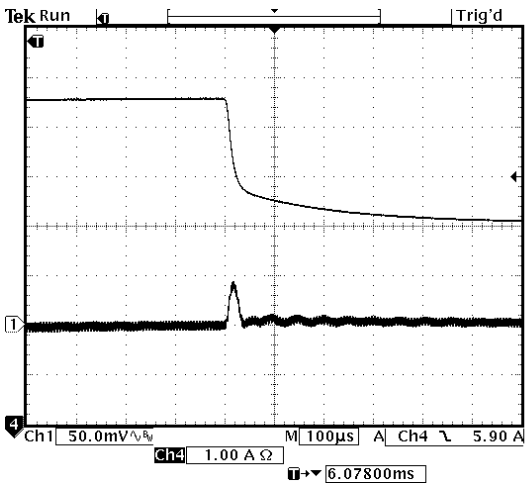


Figure 14: Typical Transient Response 75% - 50% Step Load Change

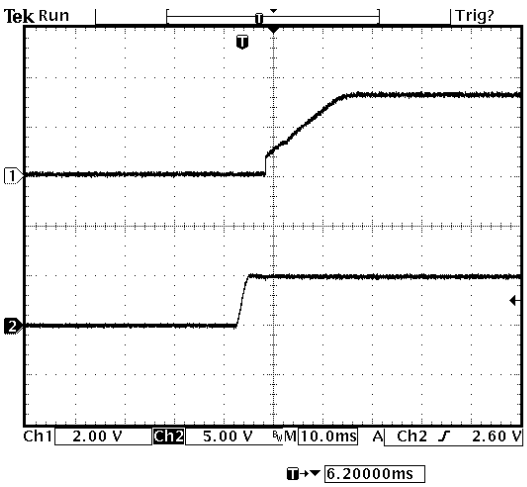


Figure 15: Typical Power-up Characteristic

3V3S Model

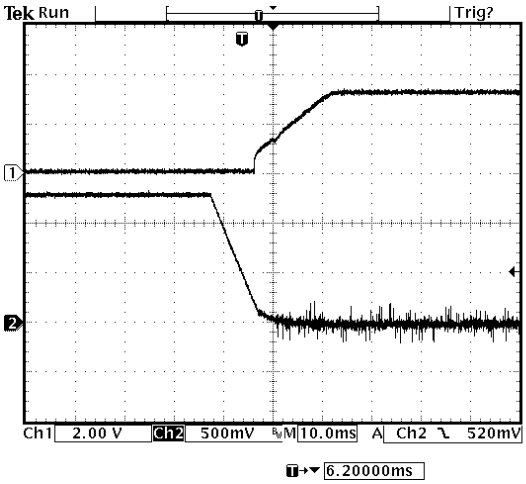


Figure 16: Control On/Off Characteristic

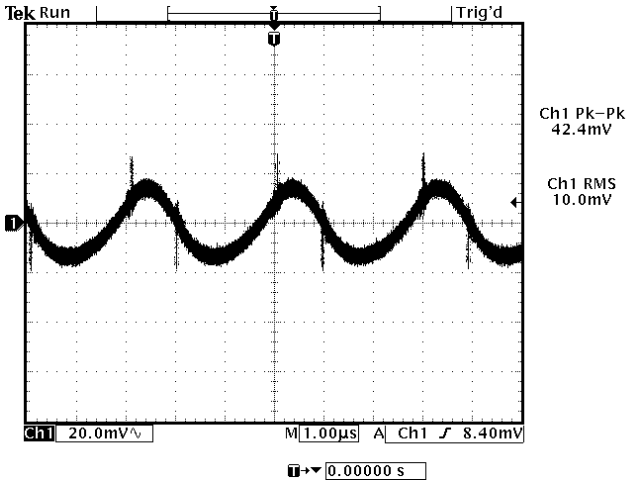


Figure 17: Typical Ripple and Noise

3V3W Model

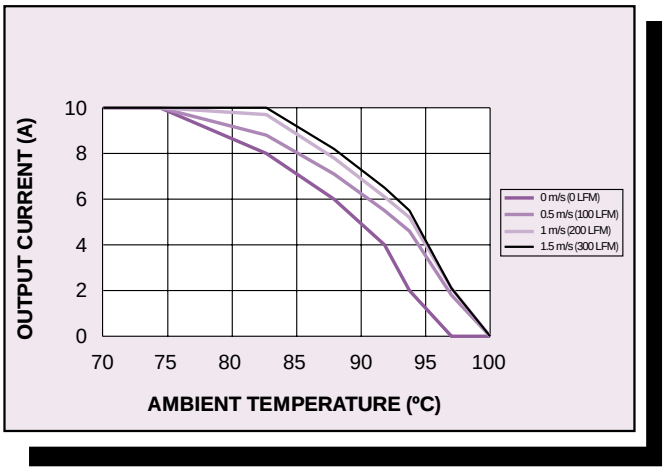


Figure 18: De-rating Curve with V_{in} = 5V and Vout = 3.3V

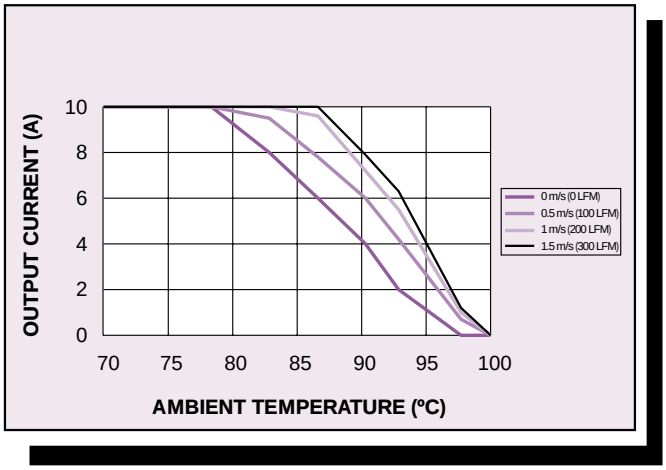


Figure 19: De-rating Curve with V_{in} = 5V and Vout = 0.8V

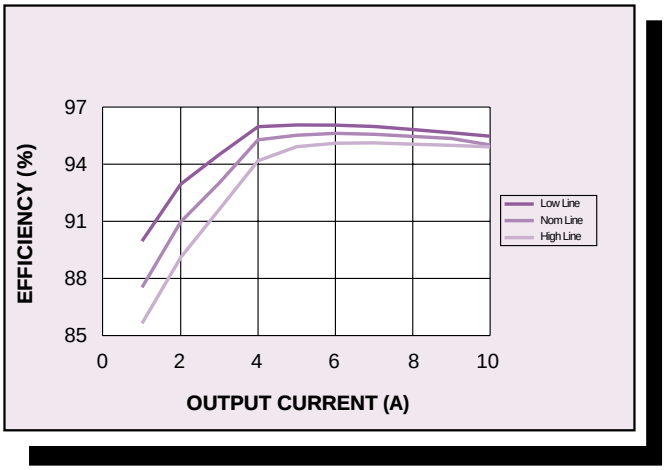


Figure 20: Efficiency vs Load

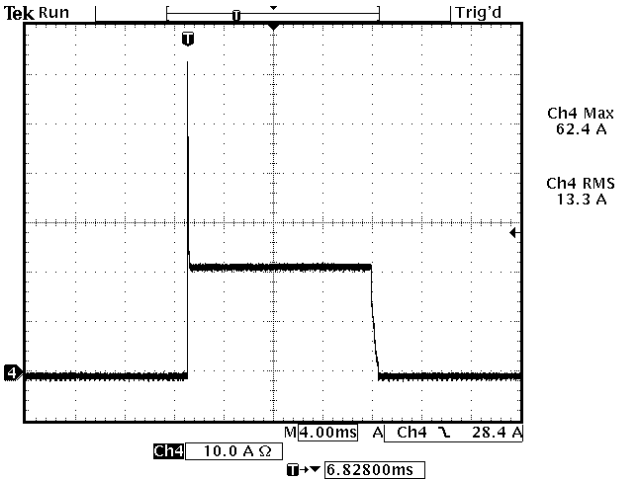


Figure 21: Short Circuit Characteristic

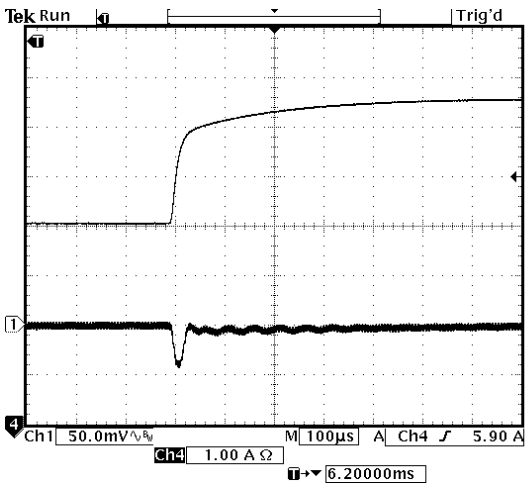


Figure 22: Typical Transient Response 50% - 75% Step Load Change

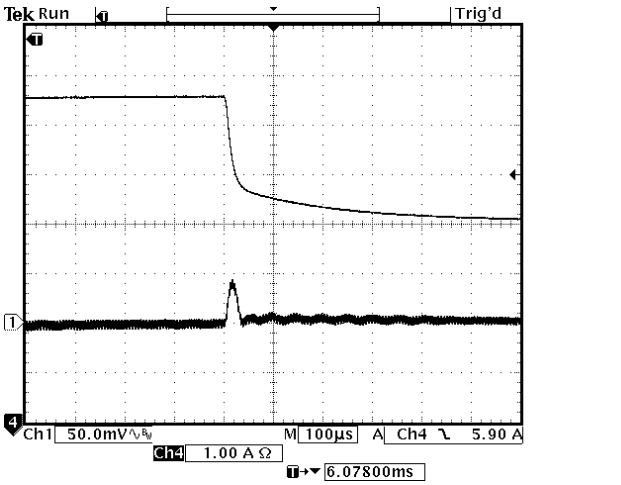


Figure 23: Typical Transient Response 75% - 50% Step Load Change

3V3W Model

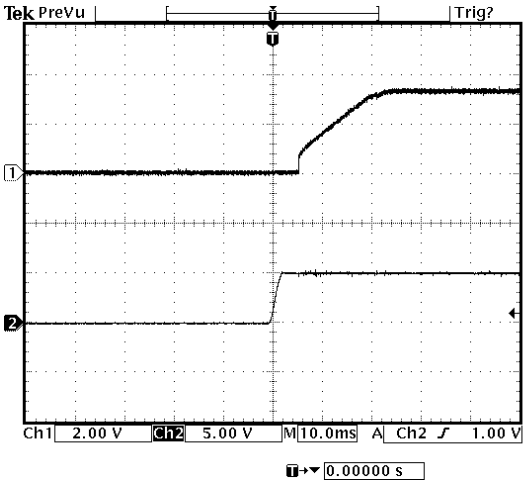


Figure 24: Typical Power-up Characteristic

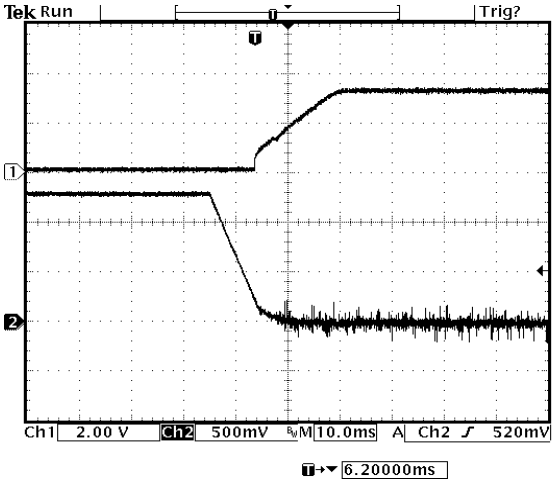


Figure 25: Control On/Off Characteristic

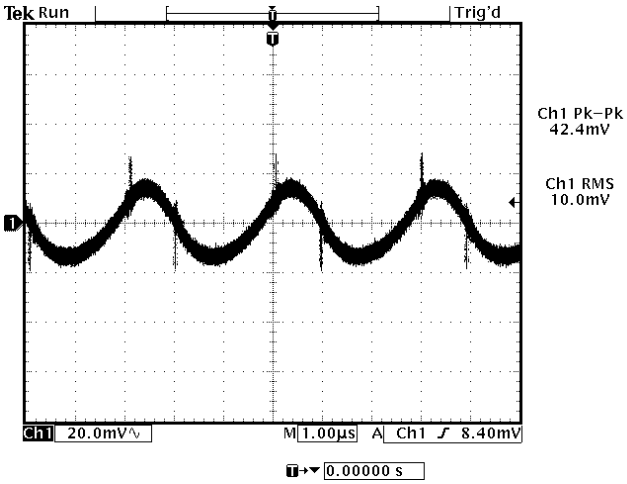


Figure 26: Typical Ripple and Noise

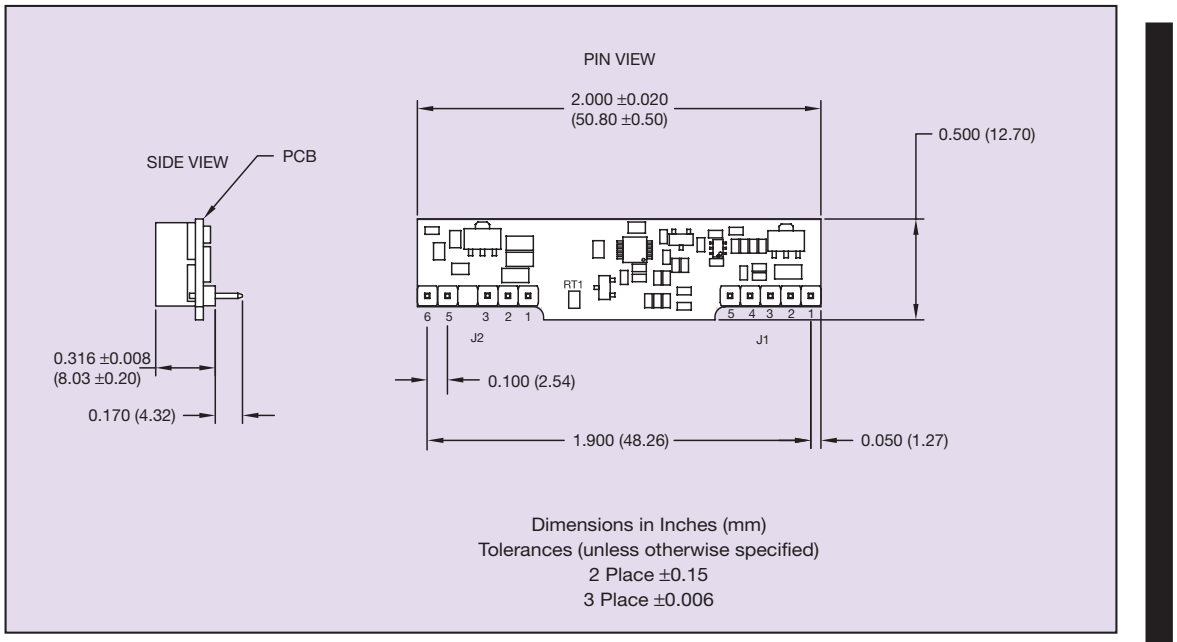


Figure 27: Mechanical Drawing - Horizontal

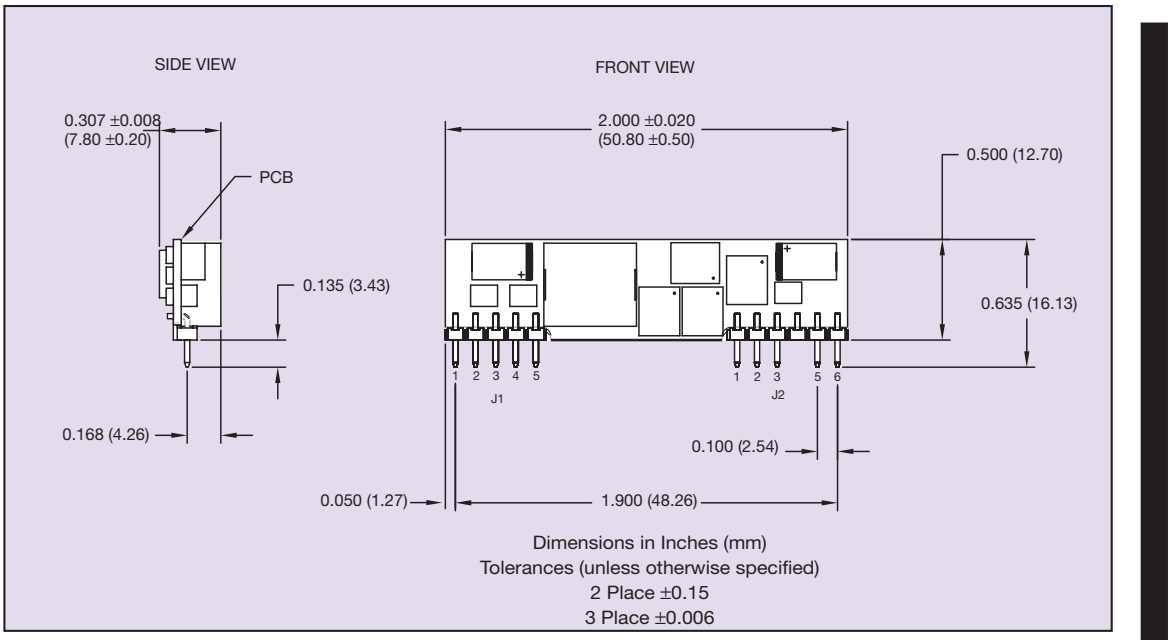


Figure 28: Mechanical Drawing - Vertical

Note 1

Hot spot temperature is defined as the highest temperature measured at any one of the specified thermal reference points. See Figure 29: Thermal reference points.

Note 2

Is referenced to Ground

Note 3

The SIL10 is supplied as standard with active low logic.
Control input pulled low: Unit On
Control input left open: Unit On

Note 4

Thermal reference set up: Unit mounted on an edge card test board 215mm x 115mm. Test board mounted vertically. For test details and recommended set-up see Application Note 134 .

CAUTION: Hazardous internal voltages and high temperatures. Ensure that unit is accessible only to trained personnel. The user must provide the recommended fusing in order to comply with safety approvals.

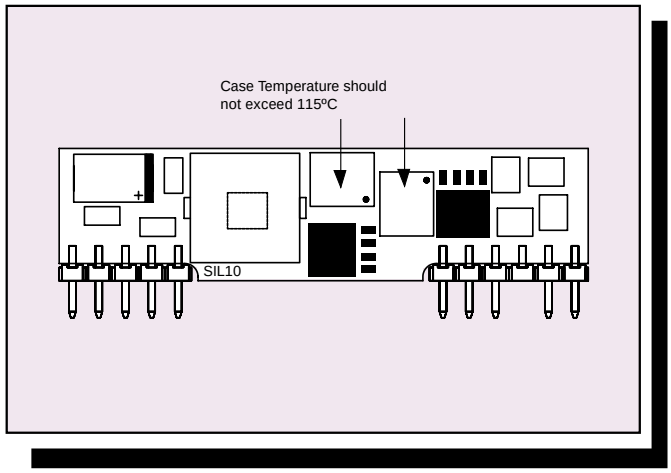


Figure 29: Thermal Reference Points

Pin Connections

Pin No.	Function
J1-1	+Vout
J1-2	+Vout
J1-3	Remote Sense (+)
J1-4	+Vout
J1-5	Ground
J2-1	Ground
J2-2	+Vin
J2-3	+Vin
J2-4	No Pin
J2-5	Trim
J2-6	Remote ON/OFF

Figure 30: Pinout

NORTH AMERICA
e-mail: sales.us@artesyn.com
800 769 7274
+508 628 5600

EUROPEAN LOCATIONS
e-mail: sales.europe@artesyn.com
IRELAND
+353 24 93130

AUSTRIA
+43 1 80150

FAR EAST LOCATIONS
e-mail: sales.asia@artesyn.com
HONG KONG
+852 2699 2868

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